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DISTRICT OF MONTANA
MISSOULA

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IN THE UNITED STATES DISTRICT COURT
FOR THE 4TH DISTRICT OF MONTANA
MISSOULA DIVISION

Jerry O'Neil,	:	Case No. CV 19-140-M-DLC-KLD
	:	
Plaintiff,	:	
	:	AMENDED COMPLAINT FOR
vs.	:	DECLARATORY AND
	:	INJUNCTIVE RELIEF
	:	
Chip Weber , in his capacity as	:	
Forest Supervisor for the	:	
Flathead National Forest;	:	
Chris Savage , in his capacity as the	:	
Forest Supervisor for the	:	
Kootenai National Forest;	:	
Carolyn Upton , in her capacity as	:	
Forest Supervisor for the	:	
Lolo National Forest;	:	
Bill Avey , in his capacity as	:	
Forest Supervisor for the	:	
Helena-Lewis and Clark	:	
National Forest; and the	:	
UNITED STATES FOREST	:	
SERVICE , a federal agency;	:	
	:	
Defendants.	:	
	:	

INTRODUCTION

1. It is my intent with this action to get the Defendants to consider - and

to increase - the albedo effect when managing the federal forests in Montana so as to decrease the local warming and the global warming that is harming the endangered species that reside in the federal forests in Montana.

2. “**ALBEDO EFFECT**” - *Universe Today*, when referring to the albedo effect, stated at <https://www.universetoday.com/39937/albedo-effect/> :

Astronomers define the reflectivity of an object in space using a term called albedo. This is the amount of electromagnetic radiation that reflects away, compared to the amount that gets absorbed. A perfectly reflective surface would get an albedo score of 1, while a completely dark object would have an albedo of 0. Of course, it's not that black and white in nature, and all objects have an albedo score that ranges between 0 and 1.

Here on Earth, the albedo effect has a significant impact on our climate. The lower the albedo, the more radiation from the Sun that gets absorbed by the planet, and temperatures will rise. If the albedo is higher, and the Earth is more reflective, more of the radiation is returned to space, and the planet cools.

An example of this albedo effect is the snow temperature feedback. When you have a snow covered area, it reflects a lot of radiation. This is why you can get terrible sunburns when you're skiing. But then when the snow covered area warms and melts, the albedo goes down. More sunlight is absorbed in the area and the temperatures increase. Climate scientists are concerned that global warming will cause the polar ice caps to melt. With these melting caps, dark ocean water will absorb more sunlight, and contribute even more to global warming.

Earth observation satellites are constantly measuring the Earth's albedo using a suite of sensors, and the reflectivity of the planet can actually be measured through Earthshine – light from the Earth that reflects off the Moon.

Different parts of the Earth contribute to our planet's overall albedo in different amounts. Trees are dark and have a low albedo, so removing trees might actually increase the albedo of an area; especially regions typically covered in snow during the winter.

3. It is also my intent to have the Defendants reclassify the areas that presently are, or in the future would be, classified as “Recommended Wilderness Areas” or “Wilderness Study Areas,” not into Wilderness, but into a new classification called “Primitive Recreation Areas” - or other suitable name. My reasons for this include to:

- a. Allow the Supervisors’ offices of the local forest districts the unfettered, or less fettered, management of these areas with local input;
- b. Enhance the cooperation of the Defendants with interested State and local governmental agencies and others in the development and management of the national forests pursuant to the *Multiple-use Sustained-yield Act of 1960*. [See the Montana 65th Legislature’s House Joint Resolution 9 urging the United States Congress to release certain wilderness study areas in Montana from consideration for inclusion in the National Wilderness Preservation System which is attached as Exhibit A.
- c. Allow trails in these areas to be created and maintained with the use of mechanical equipment;
- d. Allow the use of pedal bicycles in these areas; and
- e. Allow these areas to be managed expeditiously and economically in

such a manner as might be necessary to increase the albedo effect in order to protect their flora and fauna from global warming.

4. In December 2018, the Forest Service published a revised Forest Plan for the Flathead National Forest (the “Forest Plan for the Flathead National Forest” or “revised Forest Plan”). The revised Forest Plan and other plan amendments for the Lolo, Helena-Lewis & Clark, and Kootenai National Forests set the stage for forest management activities (e.g., logging, road development, recreation management, etc.) for at least the next 15 years in these forests.

5. The Forest Service’s 2012 Forest Planning Rules, 36 C.F.R. § 219.3, require that Defendants use the best available scientific information. It also requires that Defendants determine what information is the most accurate, reliable, and relevant to the issues being considered. Defendants were required to:

- a. Identify what information was determined to be the best available scientific information;
- b. Explain the basis for that determination;
- c. Explain how the information was applied to the issues considered;
- d. Document how the best available scientific information was used to inform the assessment, the plan decision, and the monitoring program as required, all as required by [C.F.R. §§ 219.6\(A\)\(3\)](#) and 219.14(a)(4).

e. **When it was pointed out that Defendants never considered the albedo effect, they promised to consider it in the future, but in their *Record of Decision* at page 109, they mischaracterized the concept, assuming it called for deforestation by removing all trees in the boreal forest.**

6. This case challenges the Forest Service's decision finalizing the 2018 revision to the Flathead National Forest Land Management Plan and the amendments to the Lolo, Helena-Lewis & Clark, and Kootenai National Forest plans.

MY PARTICIPATION IN THE PLANNING PROCESS

7. I have worked hard to protect and conserve the valuable wildlife, habitat, scenic character, social and economic sustainability, sustainable recreation including recreation settings, opportunities, and access, and opportunities to connect people with nature afforded by the Flathead National Forest for many decades and I remain committed to ensuring the Forest Service manages the Forest in accordance with NEPA, NFMA, 36 CFR 219 and the Forest Planning Rules.

8. I have submitted written and oral comments regarding managing our forests, with consideration of the albedo effect and the benefits of pulling forests areas out of Recommended Wilderness and Wilderness Study Area Classifications

and putting them into a new, Primitive Recreational Classification.

9. According to the accompanying “UTC-11,” [Exhibit B], I submitted my “objections to the revised forest plan(s) for the: Flathead National Forest, Regional Forester’s list of species of conservation concern, Kootenai National Forest Plan Amendment, Lolo National Forest Plan Amendment, (and the) Helena-Lewis and Clark Forest Plan Amendments.”

10. As evidenced by the attached *FMF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena-Lewis & Clark, and Kootenai NFs #46286 [10/02/2016]*. On **10/02/2016** [Exhibit C] I filed the attached documents: *LetterText.pdf* and *Letters to Nature - Effects of boreal forest vegetation on glob.pdf*.

11. On **02/12/2018** [Exhibit G], I filed documents: UTC-11; *18-0103 JerryONeil.pdf*, *18-0103 Literature.pdf*, and *LetterText.pdf* with the Forest Service.

12. My objections then - and continuing - include:

- a. The Defendants need to consider, and to increase, the albedo effect on Montana’s national forests by increasing the grazing of wild life and livestock and the harvest of timber, post, poles, and other forest products from these national forests.
- b. The Defendants need to increase the minimal amount of allowance for

the use of bicycles in the submitted forest plans. This should be accomplished by changing the designation of any lands that otherwise would be added to wilderness areas or recommended wilderness areas to "Primitive Recreation Areas" or other suitable designation; allow these areas to be managed at the local area by our local U.S.F.S. Supervisor with local input; allow the use of pedal bicycles on the trails in these areas; and allow the use of chainsaws and other mechanized equipment for the development and maintenance of these trails for hiking, biking, horseback riding, cross country skiing, other recreational activities.”

STANDING AND JURISDICTION

13. I, Jerry O’Neil, the above designated “Plaintiff,” bring this civil action against: my friend Defendant Chip Weber in his official capacity as Forest Supervisor for the Flathead National Forest; Chris Savage, in his capacity as the Forest Supervisor for the Kootenai National Forest; Carolyn Upton, in her official capacity as Forest Supervisor for the Lolo National Forest; Bill Avey, in his official capacity as Forest Supervisor for the Helena-Lewis and Clark National Forest and the United States Forest Service (collectively “Forest Service”).

14. This action takes place under the Administrative Procedure Act

(“APA”), 5 U.S.C. § 701 et seq.; for violations of the National Environmental Policy Act (“NEPA”), 42 U.S.C. § 4321 et seq.; the National Forest Management Act (“NFMA”), 16 U.S.C. § 1600 et seq.; U.S. Forest Service National Forest System Land Management Planning regulations (“Forest Planning Rules”), 36 C.F.R. 219; Executive Order 11644 (as amended by Executive Order 11989); and U.S. Department of Agriculture travel management regulations, 36 C.F.R. 212.

JURISDICTION AND VENUE

15. This Court has jurisdiction under 28 U.S.C. § 1331. Final agency action exists that is subject to judicial review under 5 U.S.C. §§ 702 and 704. An actual, justiciable controversy exists between Plaintiff and Defendants.

16. Venue is proper under 28 U.S.C. §§ 1391. All or a substantial part of the events or omissions giving rise to the claims herein occurred within this judicial district. I was born, live and maintain my office within this judicial district. Chip Weber’s office is located within this judicial district. The administrative records at issue in this litigation were prepared within this judicial district. The public lands and resources affected by the Flathead Forest Plan are located within this judicial district.

17. This case is properly filed in Missoula, Montana. The Forest Service decisions at issue in this litigation were made in Kalispell, Montana. Kalispell,

Montana is geographically located within Flathead County, Montana. The Forest Service lands affected by the decision at issue in this litigation are located in Flathead, Missoula, Lake, Lincoln Lewis and Clark, and other counties in Montana.

18. I have a significant, concrete interest in: protecting, enjoying and harvesting the flora, fauna and minerals associated with the public lands on the National Forests in Montana in such a manner as to counter global warming and benefit our society. These interests are and will continue to be harmed by the Forest Service's revised Forest Plan and a favorable ruling from this Court will redress those harms.

19. I faithfully attended the U.S. Forest Service meetings at the Red Lion Motor Inn and at the Supervisor's Office north of Kalispell. This meetings included collaborating on the Flathead National Forest Land Management Plan. Also, it appears from the form I was instructed to submit with my objections, that it covered planning on the Flathead National Forest, Kootenai National Forest, Lolo National Forest Plan, and the Helena-Lewis and Clark National forests.
[Exhibit 1]

HISTORY OF THE CASE

20. I have met with Forest Service personnel about my concerns during the administrative objection phase, and have exhausted all other options and

available remedies that I have been privy to, all to no avail. This matter is ripe for judicial review and I am compelled to pursue this civil action.

21. According to the *Final Record of Decision for the Flathead National Forest Land Management Plan*:

The decision to approve the revised land management plan for the Flathead National Forest was subject to the objection process identified in 36 CFR Part 219 Subpart B (219.50 to 219.62). A 60-day objection period on the draft records of decision, land management plan, NCDE Grizzly Bear Conservation Strategy land management plan amendments, and final EIS ran concurrently with an objection period for the Regional Forester's species of conservation concern for the Flathead National Forest. The objection period was initiated on December 14, 2017 with the publication of the notice of the opportunity to object in the newspapers of record. The Forest Service received seventy-four timely objections. Interested parties and objectors attended a series of meetings, April 11-13, 2018 in Kalispell, Montana to discuss objection issues. The reviewing officers issued their written responses to the objection issues on August 16, 2018. The written responses set forth the reasons for the response and contained instructions to the responsible officials. The written responses are the final decision by the U.S. Department of Agriculture on the objections.

22. This Court has authority to issue the relief requested under 28 U.S.C. §§ 2201 and 2202, and 5 U.S.C. §§ 702 and 706.

PARTIES

23. I, **JERRY O'NEIL**, the Plaintiff herein, am dedicated to protecting and restoring the wildlife, wild places, wild rivers and health of the Flathead

National Forest. I have particular interests in grizzly bears, Canada lynx, wolverine and bull trout and their critical habitat. I also have a particular interest in the management of forest roads and travel planning on the Flathead National Forest.

24. I use and enjoy the Flathead National Forest for skiing, snowshoeing, hiking, fishing, hunting, camping, photographing scenery and wildlife, and engaging in other aesthetic, recreational, scientific, spiritual, vocational, and educational activities. I use the areas within the Flathead National Forest that have been designated as open to, and suitable for, snowmobile, motorcycle and bicycle use through the revised Forest Plan. As a result of the decisions made in the revised Forest Plan, my use and enjoyment of these specific areas will be diminished. I intend to continue to use and enjoy the areas opened or suitable to these uses frequently and on an ongoing basis in the future. I rely on the Defendants to follow the laws pertaining to environmental review and travel planning in order that I and my friends may stay informed and participate in travel planning decisions, and my interests in participating in such decisions are injured by the failures of the Forest Service to follow the laws and regulations as described in this Complaint.

25. My aesthetic, recreational, scientific, spiritual, vocational, and educational interests have been, and will be, adversely affected and irreparably

injured if the Forest Service is allowed to continue implementing the revised Forest Plan as approved. These are actual, concrete injuries caused by the Forest Service's failure to comply with mandatory duties under NEPA, Forest Service regulations, U.S. Department of Agriculture regulations, the APA, and pertinent Executive Orders. I have also suffered procedural harm and injury in fact from the Forest Service's failure to comply with mandatory duties under NEPA, the APA, Forest Service regulations, U. S. Department of Agriculture regulations, and pertinent Executive Orders. The requested relief would redress these injuries. This Court has the authority to grant my requested relief.

26. I promote the sound use of public lands, the protection of the wildlife that inhabit such lands, and the promotion of motorized and non-motorized summer and winter recreation opportunities on public lands. I have an interest in insuring that federal agencies follow the law, including travel planning processes and procedures of the statutes, regulations, and Executive Orders listed in this Complaint. As a person involved in the political process, including 8 years in the Montana State Senate and 4 years in the Montana State House of Representatives, I am concerned about allowing my constituents living in House District 3 to benefit economically from their use of these forests. [HD-3 is the north-eastern house district in Flathead County.]

27. If this Court issues the relief requested, the harm to my mission and

goals will be alleviated and/or lessened and I will benefit directly.

28. The Forest Service is responsible for implementing NEPA and its implementing regulations, NFMA, Forest Planning Rules, Executive Order 11644 (as amended), and travel management regulations.

BACKGROUND

The Flathead National Forest

29. The Flathead National Forest (the “Flathead” or “Forest”) in northwestern Montana is a crown jewel of our nation’s public lands system. The Forest supports some of the last-remaining, fully intact native ecosystems in the country and is home to a wide variety of rare and imperiled native species, including: grizzly bears, wolverine, and Canada lynx. The Forest is also rich in aquatic resources, and is home to endangered runs of bull trout and vital corridors of bull trout critical habitat.

30. The 2.4 million-acre Flathead National Forest lies in the heart of the Rocky Mountains and the core of the Crown of the Continent Ecosystem, just west of the continental divide and just south of the Canadian border.

31. It’s geographic location makes the Flathead a preeminent landscape for connecting habitats and core populations of a diverse array of wildlife. The Forest is inhabited by hundreds of species of native mammals, birds, fish, reptiles,

amphibians, and invertebrates. The Forest is home to one of the last remaining — and most ecologically intact — assemblages of medium to large carnivores in the contiguous United States, harboring grizzly bears, Canada lynx, wolverine, and gray wolves (among others) within its borders.

32. The Flathead is part of Canada lynx critical habitat unit 3 of the U.S. Fish and Wildlife Service’s Northern Rocky Mountains region, and is home to one of the largest populations of federally protected, threatened grizzly bears in the lower 48 states. The Forest is the largest public landowner within the Northern Continental Divide Ecosystem (“NCDE”), one of the U.S. Fish and Wildlife Service’s seven grizzly bear ecosystems in the continental United States. The largest known population of wolverines, a species proposed for listing under the federal Endangered Species Act (“ESA”), also roam the Flathead’s unparalleled high-alpine environs.

33. The Forest’s abundant and fertile aquatic resources historically have provided high water quality and crucial habitats for wildlife and aquatic species. Bull trout and west slope cutthroat trout spawn in natal streams on the Forest upon migration from the Forest’s namesake, Flathead Lake, which is one of the largest natural freshwater lakes in the American West.

34. But the air, land and water temperatures in these forests are increasing due to global warming and, unless the relief I seek is granted, it will compromise

our abundant and fertile flora, fauna and aquatic resources, including those that are currently listed as “endangered”.

Forest Plan Revision for the Flathead National Forest

35. Forest Plans are the primary source of direction for a National Forest. Forest Plans are meant to provide forest-wide, geographic area, and management area desired conditions, objectives, standards, guidelines, and suitability of lands for specific uses.

36. NFMA directs revision of Forest Plans from time to time based on significant changes in conditions, but at least every fifteen years.

Forest Planning Framework

37. The Flathead National Forest (and presumably the other national forests in Montana) revised its Forest Plan under the requirements of the Forest Service’s 2012 Forest Planning Rules, 36 C.F.R. § 219 et seq. These rules require inclusion of plan components, including standards or guidelines, that address the maintenance or restoration of vegetation and ecosystems to provide for species diversity, including threatened and endangered species.

38. On August 15, 2018, the Forest Service reviewing officer issued its response to eligible objections. The August 15, 2018 response to objections

included instructions for additional analysis the Forest Service needed to undertake before issuing the final ROD.

39. The only method that was proposed in the planning process for maintaining or restoring the ecosystems presently threatened by global warming was my proposal to study and increase the albedo effect. Defendants totally misconstrued and mischaracterized my proposal saying that I proposed “**removing all trees in the boreal forest as part of a sensitivity analysis.**” [See Exhibit ? *Flathead National Forest Land Management Plan Revision and the Northern Continental Divide Ecosystem Plan Amendments - Reviewing Officer Response to Eligible Objections*, pg 109]. This closed response was made without using the best available scientific information when making this decision.

40. The Proposed Solution presented with my objection was:

Increasing the grazing of livestock and the harvest of timber, post, poles, and other forest products from these national forests in order to increase the albedo effect.

The NEPA Process

41. My objections to the Flathead National Forest's forest plan and Regional Forester's species of conservation list, the NCDE Grizzly Bear Conservation Strategy forest plan amendments for the Helena-Lewis and Clark, Kootenai, and Lolo National Forests, and the associated final environmental impact statement were filed on or before February 12, 2018.

42. The Forest Service completed its final EIS for the revised Forest Plan in November 2018.

43. Forest Supervisor Chip Weber signed the final ROD for the revised Forest Plan on December 24, 2018.

44. This Record of Decision failed to consider the albedo effect and failed to consider changing the status of our national forests in order to make it more practical to increase the albedo effect in our national forests. There were no other proposals included in the plan that would contribute to global or local cooling. Other than my input, there was no study of the albedo effect, or of any other method for contributing to global cooling to improve the habitat for the endangered flora, fauna and aquatic resources, including those that are currently listed as “endangered”.

45. I am informed that on December 27, 2018, the Forest Service published a notice in the Federal Register that Forest Supervisor Chip Weber had signed the final ROD for the Flathead National Forest’s revised Forest Plan. The Flathead National Forest revised Forest Plan took effect on January 26, 2019.

I. CONSIDERING HOW THE ALBEDO EFFECT LOWERS GLOBAL AND LOCAL WARMING

Endangered Species Act Consultation

46. The Forest Service completed a Biological Assessment on October

31, 2017. This Biological Assessment assessed potential impacts to threatened and endangered species from implementation of the Flathead National Forest's revised Forest Plan. The Biological Assessment concluded the revised Forest Plan is likely to adversely affect bull trout and designated bull trout critical habitat, grizzly bear, Canada lynx, and Canada lynx critical habitat.

Wildlife on the Flathead National Forest

47. The Flathead National Forest is home to a wealth of rare and imperiled wildlife species. The Forest provides essential habitat for wildlife not found elsewhere in the contiguous United States.

Grizzly Bears (*Ursus arctos horribilis*)

48. Grizzly bears (*Ursus arctos horribilis*) are a subspecies of brown bear (*U. arctos*) that occur in North America, Europe, and Asia.

49. Grizzly bears once occurred throughout the western half of the contiguous United States, central Mexico, western Canada, and most of Alaska. Prior to European settlement, there were approximately 50,000 grizzly bears in the western United States. By the 1930s, grizzly bears had lost approximately 98 percent of their historic range in the western United States. Of the 37 grizzly bear populations present in the contiguous United States in 1922, 31 ceased to exist by

1975. By the early 1970s, only a few hundred grizzly bears remained in the contiguous United States.

50. In 1975, FWS listed all grizzly bears in the contiguous United States as a threatened species under the federal ESA. In the 1975 listing, FWS determined grizzly bears in the contiguous United States were threatened by a combination of factors, including a significant loss of habitat. At that time, grizzly bear range was confined to only three regions, one of which was the Bob Marshall Ecosystem in northern Montana.

51. The Flathead National Forest is home to one of the largest remaining populations of grizzly bears in the contiguous United States. This population of grizzly bears on the Flathead National Forest is part of the Northern Continental Divide Ecosystem (NCDE) grizzly bear population. There are approximately 900 grizzly bears in the NCDE.

52. Grizzlies in the NCDE are threatened by multiple factors, including the impacts of climate change. The changing climate impacts the availability of grizzly bear food resources and the number, size, and location of large wildfires that can disrupt grizzly bear habitat. Therefore it is essential the forest plan considers how to increase the albedo effect for the preservation of the grizzly bear.

Canada Lynx (Lynx canadensis)

53. The Canada lynx (lynx) is a medium-sized cat with long legs, large paws, webbed toes adapted to walking on snow, long tufts on the ears, and a short, black tipped tail.

54. Lynx are highly specialized hunters of the snowshoe hare, their primary food source. Lynx have secondary food sources such as red squirrels.

55. In Montana, snowshoe hares account for approximately 96 percent of the biomass in the lynx diet.

56. Lynx habitat is closely correlated with snowshoe hare habitat in much of North America.

57. Lynx are habitat specialists. In the western United States, lynx primarily occur in spruce-fir vegetation types that receive persistent snowfall. Lynx typically inhabit gentle, rolling topography with dense horizontal cover for the hare to reside in; persistent snow cover in the forest openings for the lynx to make their dens; and moderate to high snowshoe hare density.

58. Lynx winter habitat is different from snowshoe hare winter habitat. Lynx winter habitat is more limiting on lynx than snowshoe hare winter habitat.

59. Lynx are known to persist and reproduce in areas that have experienced large-scale forest mortality events from insects or other causes and likely have a higher albedo effect related to deeper snowpack.

60. The average home range for lynx is 39.6 square kilometers. For female lynx, the average home range is 31.1 square kilometers. For male lynx, the average home range is 42.9 square kilometers.

61. Lynx make exploratory movements beyond identified home ranges. In Montana, these exploratory movements range from approximately 15 to 40 kilometers. The duration of these exploratory movements ranges from one week to several months.

62. Young male lynx are likely to disperse to a new home ranges while female lynx tend to establish home ranges adjacent to their mothers.

63. Lynx populations are declining across the contiguous United States, including in the Flathead National Forest in Montana and are listed as threatened under the federal ESA.

64. Lynx experience various threats to their existence, including climate change that is a threat that can cause adverse effects to lynx' existence.

65. Therefore it is essential that ways to increase the albedo effect are included in the forest plan in order to protect the lynx.

Wolverine (Gulo gulo luscus)

66. The wolverine is the largest member of the Mustelidae (weasel) family.

67. The wolverine resembles a small bear, but with a bushy tail and a broad, rounded head, short rounded ears, small eyes, and a body custom-built for high elevation mountain living.

68. The wolverine's large, crampon-clawed feet (each with five toes with curved, semi-retractile claws used for digging and climbing) are enormous relative to its body which allow the animal to spread its weight like snowshoes. This gives wolverines an advantage over most competitors and prey during cold months.

69. Wolverines operate at a higher metabolic rate than other animals their size. To hold in heat, wolverines wear a double fur coat which includes a dense inner layer of air-trapping wool beneath a cover of stout guard hairs which add extra insulation. These stout guard hairs, which drape from the wolverine, are textured to resist absorbing moisture and excel at shedding frost (this makes a wolverine's pelt extremely desirable and valuable).

70. Reproductive rates for wolverines are among the lowest known for mammals.

71. Approximately 40 percent of all female wolverines are capable of giving birth at two years old (the average age of reproduction, however, is three years). Female wolverines become pregnant most years and, on average, produce a litter of approximately 3.4 kits. It is common, however, for females to forgo reproducing every year, possibly saving resources to increase reproductive success

in subsequent years. Female wolverines are also known to reabsorb or spontaneously abort litters prior to giving birth.

72. Breeding generally occurs from late spring to early fall. Female wolverines undergo delayed implantation until the following winter to spring, when active gestation lasts from 30 to 40 days and their litters are born from mid-February through March.

73. Female wolverines use birthing dens that are excavated in deep snow such as that likely to be present in forest clearings. No records exist of wolverines denning anywhere but in snow in the contiguous United States.

74. Stable snow pack greater than five feet deep appears to be a requirement for natal denning because it provides security for offspring and buffers cold winter temperatures.

75. Female wolverines have been known to abandon reproductive dens when temperatures warm and snow conditions become wet. This may indicate that the condition of the snow is important to successful reproduction and that the onset of spring snow melt may force female wolverines to move kits into alternate denning sites with better snow conditions if they are available.

76. Once the litter is born, wolverines will continue to use the natal den through late April and early May (occupancy of such dens varies from 9 to 65 days). As wolverines grow, females move the kits to multiple secondary

“maternal” dens. Researchers think the timing of natal den abandonment may be tied to the accumulation of water in the dens due to snow melt, the maturation of offspring, disturbance, and/or geographic location.

77. Wolverines require secure, core areas of habitat that are large and linked to other sub-populations. Wolverines require a lot of space; the availability and distribution of food is likely the primary factor in determining wolverine movements and home range size.

78. Female wolverines forage close to den sites in early summer, progressively ranging further from dens as kits become more independent.

79. The best available science reveals climate change will decrease the amount of available wolverine habitat and increase fragmentation between areas of suitable wolverine habitat in the contiguous United States. This will result in a smaller and more isolated population of wolverines in contiguous United States.

80. Peer-reviewed, climate change models predict that warming temperatures and changes in precipitation will result in reduced snow pack and permanent loss of wolverine habitat in the contiguous United States.

81. By 2045, the best available science estimates that 23 percent of current wolverine habitat in the contiguous United States will be lost due to climate warming. That loss expands to 63 percent of wolverine habitat by the time interval between 2070 and 2099.

82. The best available science reveals that as habitat patches become smaller and more isolated, they are likely to lose the ability to support wolverines. Loss of wolverine habitat also increases habitat fragmentation as islands of wolverine habitat become smaller and intervening areas between wolverine habitat become larger. This habitat alteration will result in the loss of genetic diversity due to inbreeding within a few generations. Further, isolation of wolverines on small habitat islands with reduced connectivity to other populations would also increase the likelihood of subpopulations being lost due to the random structure of their populations, impairing the functionality of the wolverine metapopulation in the contiguous United States.

83. If we want to save the wolverines, we need to take into consideration and increase the albedo effect in order to provide optimal habitat for their survival.

84. Therefore it is essential that ways to increase the albedo effect are considered in order to preserve the wolverines.

Bull Trout (*Salvelinus confluentus*) and Bull Trout Critical Habitat

85. Bull trout (*Salvelinus confluentus*) is a species listed as threatened under the federal ESA throughout the contiguous United States. Since listing bull trout as threatened, experts have designated and redesignated bull trout critical habitat multiple times. In 2010 critical habitat for bull trout that included critical

habitat on the Flathead National Forest was designated.

86. The Flathead supports 12 bull trout core areas of the Columbia Headwaters Recovery Unit. Nine of the core areas are considered “simple” core areas, each representing a single local bull trout population. Three of the core areas are considered “complex” because they represent larger interconnected habitats, each containing multiple spawning streams and considered to host separate and largely genetically identifiable local bull trout populations. The Flathead also contains four designated critical habitat sub-units for bull trout, all within the Clark Fork River Basin Critical Habitat Unit (CHU 32).

87. Bull trout are primarily freshwater fish, with occasional instances of migrating from the ocean up rivers to spawn. Historically, bull trout occurred from Alaska to California, however they now live primarily in Washington, Oregon, Idaho, and Montana. Bull trout can migrate up to 150 miles to spawn within the Flathead River system.

88. Bull trout are a cold-water fish of relatively pristine streams and lakes that have: cold, clean, complex and connected habitat. Bull trout are sensitive to water temperatures above 54 degrees Fahrenheit; they require cold water for all stages of their life cycle. Juvenile bull trout distribution is limited by stream temperatures above 59 degrees Fahrenheit. Optimum stream temperature for juvenile bull trout is between 44 and 46 degrees Fahrenheit. Optimum stream

temperature for incubation of juvenile bull trout eggs is between 35 to 39 degrees Fahrenheit.

89. The 2015 Recovery Plan for bull trout identifies climate change effects as a factor affecting bull trout and bull trout critical habitat. Climate change may affect bull trout and designated bull trout critical habitat by warming stream temperatures, altering stream hydrology, and changing the frequency, magnitude, and extent of climate-induced events including floods, droughts, and wildfires. A warming climate is expected to shrink cool spawning and rearing areas.

90. Therefore it is essential that we consider ways to increase the albedo effect and pursue them in order to save the bull trout.

II. RECLASSIFYING “RECOMMENDED WILDERNESS AREAS” TO “PRIMITIVE RECREATIONAL AREAS”

The *Multiple-use Sustained-yield Act of 1960* (16 U.S.C. 528; Public Law 86–517) states:

§ 528. Development and administration of renewable surface resources for multiple use and sustained yield of products and services; Congressional declaration of policy and purpose.

It is the policy of the Congress that the national forests are established and shall be administered for **outdoor recreation**, range, timber, watershed, and wildlife and fish purposes. The purposes of sections 528 to 531 of this title are declared to be supplemental to, but not in derogation of, the purposes for which the national forests were established as set forth in section 475 of this title. Nothing herein shall be construed as affecting the jurisdiction or responsibilities of the several states with respect to wildlife and fish on the

national forests. Nothing herein shall be construed so as to affect the use or administration of the mineral resources of national forest lands or to affect the use or administration of Federal lands not within national forests.(Pub. L. 86–517, § 1, June 12, 1960, 74 Stat. 215.) (emphasis added)

§ 529. Authorization of development and administration consideration to relative values of resources; areas of wilderness

The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the national forests for multiple use and sustained yield of the several products and services obtained therefrom. In the administration of the national forests due consideration shall be given to the relative values of the various resources in particular areas. The establishment and maintenance of areas of wilderness are consistent with the purposes and provisions of sections 528 to 531 of this title.(Pub. L. 86–517, § 2, June 12, 1960, 74 Stat. 215.)

§ 530. Cooperation for purposes of development and administration with State and local governmental agencies and others

In the effectuation of sections 528 to 531 of this title the Secretary of Agriculture is authorized to cooperate with interested State and local governmental agencies and others in the development and management of the national forests.

(Pub. L. 86–517, § 3, June 12, 1960, 74 Stat. 215.)

§531. Definitions

As used in sections 528 to 531 of this title the following terms shall have the following meanings:

(a) “Multiple use” means: The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for **periodic adjustments in use to conform to changing needs and conditions**; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit

output.

(b) “Sustained yield of the several products and services” means the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land.

(Pub. L. 86–517, §4, June 12, 1960, 74 Stat. 215.)

§532. Roads and trails system; Congressional findings and declaration of policy

The Congress hereby finds and declares that the construction and maintenance of an adequate system of roads and trails within and near the national forests and other lands administered by the Forest Service is essential if increasing demands for timber, **recreation**, and other uses of such lands are to be met; that the existence of such a system would have the effect, among other things, of increasing the value of timber and other resources tributary to such roads; and that such a system is essential to enable the Secretary of Agriculture (hereinafter called the Secretary) to provide for intensive use, protection, development, and management of these lands under principles of multiple use and sustained yield of products and services.

(Pub. L. 88–657, §1, Oct. 13, 1964, 78 Stat. 1089.)

91. Having represented the residents and timber and tourist businesses of northeast Flathead County in the Montana Legislature, I understand how important it is for them to get their workers and their tourist clients into the federal forests located in Montana. There are far more tourists traveling into this area with bicycles attached to their cars and RV’s than there are pulling horse trailers. To allow the use of bicycles and the creation and maintenance of trails by mechanical means would be good for my constituents economy.

92. The 65th Montana Legislature passed House Joint Resolution 9 “urging the United States Congress to release certain wilderness study areas in

Montana from consideration for inclusion in the National Wilderness Preservation System.

FIRST CLAIM FOR RELIEF - Violations of Forest Planning Rules, 36 C.F.R. § 219

Count I: Failure to Adopt Plan Components that Provide the Ecological Conditions Necessary to Recover Listed Species and Conserve Proposed Species.

93. Plaintiff realleges and incorporates by reference all preceding paragraphs.

94. The revised Forest Plans for the Flathead National Forest and the other national forests in Montana violate the 2012 Forest Planning Rules because they lack plan components to provide the ecological conditions necessary to recover species listed under the federal ESA and to conserve species proposed for listing under the federal ESA. Specifically they lack any consideration of increasing the albedo effect to counter global warming and to provide localized cooling for the preservation and enhancement of the flora and fauna in the National Forests in Montana. Defendants have declined to consider the only proposal presented to them that would and have accomplished this.

95. The 2012 Forest Planning Rules require a revised Forest Plan “provide for the diversity of plant and animal communities.” 36 C.F.R. § 219.9. A revised forest plan must provide plan components, “including standards or

guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore their structure, function, composition, and connectivity.” Id. § 219.9(a)(1).

96. The Forest Service must “determine whether or not the plan components required” under § 219.9(a) “provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the project area.” Id. § 219.9(b)(1). If the Forest Service determines that the plan components required in § 219.9(a) are “insufficient to provide such ecological conditions, then additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area.” Id.

97. A forest plan must include a monitoring program that enables the responsible official to determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed. Id. § 219.12(a)(1). The monitoring program must include monitoring questions and associated indicators “designed to inform the management of resources on the plan area, including by testing relevant assumptions, tracking relevant changes, and

measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives." Id. § 219.12(a)(2).

98. The monitoring program must contain one or more monitoring questions and associated indicators addressing, inter alia, the "status of a select set of the ecological conditions required under § 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern." Id. § 219.12(a)(4)(iv).

99. The revised Forest Plan lacks any provisions for considering and monitoring the albedo effect; the only proposal that was presented for the forest plan that would slow or reverse global warming, as it affects the endangered flora and fauna and aquatic species on the federal forests in Montana.

100. The revised Forest Plan lacks any standards to increase the late spring in-stream inflow of water from snow melt necessary to protect the temperature of the watersheds in the conservation watershed network as would happen if Defendants were to manage our forests in such a way as to increase the albedo effect.

101. The revised Forest Plan monitoring program lacks questions and associated indicators to test relevant assumptions, track relevant changes, or measure management effectiveness and progress toward achieving or maintaining

the ecological conditions required under § 219.9 to contribute to the recovery of bull trout and other endangered aquatic flora and fauna.

102. The Forest Service failed to adopt plan components that provide the ecological conditions necessary to lower or reverse the local effects of global warming and thus to recover listed species and conserve proposed species as required by the 2012 Forest Planning Rules, 36 C.F.R. § 219. This is arbitrary, capricious, and not in accordance with the APA. 5 U.S.C. § 706(2)(A).

Count I: Failure to Adopt Plan Components to Maintain or Restore the Ecological Integrity of Riparian Areas in the Plan Area.

103. Plaintiff realleges and incorporate by reference all preceding paragraphs.

104. The revised Forest Plan for the Flathead National Forest violates the 2012 Forest Planning Rules because it lacks standards and guidelines to maintain or restore the ecological integrity of riparian areas in the plan area.

105. The 2012 Forest Planning Rules require a revised Forest Plan to “include plan components, including standards or guidelines, to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or optimize **Water temperature** of water courses; Plan components must ensure that no management practices causing detrimental

changes in water temperature that seriously and adversely affect water conditions or fish habitat shall be permitted within the riparian management zones or the site-specific delineated riparian areas.” Id. § 219(a)(3)(ii)(B).

106. The revised Forest Plan failed to adopt plan components to maintain or restore the ecological integrity of riparian areas in the plan area with its failure to consider the albedo effect as it effects the water temperature within the riparian management zones or the site-specific delineated riparian areas. For example:

107. The Forest Service failed to adopt plan components that consider the albedo effect to maintain or restore the water temperatures of riparian areas in the plan area as required by the 2012 Forest Planning Rules, 36 C.F.R. § 219, which is arbitrary, capricious, and not in accordance with the APA. 5 U.S.C. § 706(2)(A).

SECOND CLAIM FOR RELIEF - Violations of the National Environmental Policy Act, 42 U.S.C. § 4321

Count I: Failure to Take a “Hard Look” at the Direct, Indirect, and Cumulative Impacts of the Revised Forest Plan for the Flathead National Forest.

108. Plaintiff realleges and incorporates by reference all preceding paragraphs.

109. The revised Forest Plan for the Flathead National Forest violates NEPA because the final ROD and final EIS fail to take a hard look at the direct,

indirect, and cumulative impacts of the Forest Service's proposed actions.

110. The regulations implementing NEPA require the Forest Service to disclose and analyze the environmental effects of the proposed action and alternatives to it. 40 C.F.R. § 1500.1(b). Specifically, the regulation explains that “NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.” Id.

111. The Forest Service is required to disclose and analyze the direct, indirect, and cumulative effects of the proposed action on the environment. 40 C.F.R. §§ 1502.16, 1508.7, 1508.8, 1508.25(c)(3), 1508.27(b)(7).

112. When analyzing cumulative effects, the Forest Service must analyze the effects on the environment resulting from the incremental impacts of the action, and its alternatives, when added to other past, present, and reasonably foreseeable future actions. 40 C.F.R. § 1508.7.

113. To satisfy the requirements of the NEPA regulations, the Forest Service must take a “hard look” at the impacts resulting from the proposed action.

114. The Forest Service failed to take the requisite “hard look” at the direct, indirect, and cumulative impacts on various aspects of the Flathead National Forest's (and other federal forests in Montana) natural environment likely

to result from considering and subsequently increasing the albedo effect through management efforts under the revised Forest Plan. For example, but not limited to:

- a. The Forest Service failed to take a hard look at the direct, indirect, and cumulative impacts of increasing the albedo effect through the implementation of the Forest Plan on wolverine. This includes the impacts associated with global warming and how it can be reduced by increasing the albedo effect when managing the national forests in Montana.
- b. The Forest Service failed to take a hard look at the direct, indirect, and cumulative impacts associated with global warming and how it can be reduced by increasing the albedo effect with the implementation of the Forest Plan on grizzly bear.
- c. The Forest Service failed to take a hard look at the direct, indirect, and cumulative impacts associated with global warming and how it can be reduced by increasing the albedo effect with the implementation of the Forest Plan on Canada lynx and its critical habitat.
- d. The Forest Service failed to take a hard look at the direct, indirect, and cumulative impacts associated with global warming and how it can be reduced by increasing the albedo effect with the

implementation of the Forest Plan on bull trout and its critical habitat.

- e. Although I raised the issue of increasing the albedo effect and how it would lower the ambient temperature and increase the late spring snowpack and increase the amount of cooler water in the streams and rivers, the Forest Service failed to disclose and analyze the environmental effects of the proposed action and alternatives to it. Other than my input, the Forest Service failed to make available to the public high quality environmental information, accurate scientific analysis, or expert agency comments regarding the benefits and any negative consequences that might accrue from an increase of the albedo effect when managing the federal forests in Montana.

Count II: Failure to Consider changing the status of any new additions of forest land to primitive recreational areas rather than to wilderness status.

115. Plaintiff realleges and incorporates by reference all preceding paragraphs.

116. The Forest Service violated NEPA and the APA because it failed to provide meaningful public comment opportunities to the public during its consideration of environmental impacts resulting from the adoption and

implementation of the revised Forest Plan for the Flathead National Forest.

117. The regulations implementing NEPA require the Forest Service to disclose and analyze the environmental effects of the proposed action and alternatives to it. 40 C.F.R. § 1500.1(b). Specifically, the regulation explains that “NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.” Id.

118. Here, the Forest Service never afforded the public the opportunity to review and comment on final documents that served as a basis for its final decision, in violation of NEPA’s public participation requirements. For example, but not limited to:

a. 16 USC 531 states that:

“the construction and maintenance of an adequate system of roads and trails within and near the national forests and other lands administered by the Forest Service is essential if increasing demands for timber, **recreation**, and other uses of such lands are to be met; that the existence of such a system would have the effect, among other things, of increasing the value of timber and other resources tributary to such roads; and that such a system is essential to enable the Secretary of Agriculture (hereinafter called the Secretary) to provide for intensive use, protection, development, and management of these lands under principles of multiple use and sustained yield of products and services.”

In order to increase the albedo effect of our forests by active management, it

is essential that we have adequate access to these forests.

- b. How continuing to allow pedal bikes in the areas presently designated as “Recommended Wilderness Areas” would be economically beneficial for the communities that are in the vicinity of these areas.
- c. Cycling, also known as biking, is a popular leisure activity and, in many cases, a means of transportation. In 2016, around 12.4 percent of Americans cycled on a regular basis. The number of cyclists/bike riders in the U.S. has increased over the past three years from around 43 million to 47.5 million in 2017.
- d. In January 2017 there were an estimated 2 million horse owners in the United States and a total of 7.1 million Americans are involved in the industry as owners, service providers, employees and volunteers.
- e. Far more tourists had bicycles attached to their vehicles when entering Montana for their vacations than those who had horses with them.
- f. We have about 3.5 million acres of wilderness in Montana that is set aside for those who have horses that excludes the locals and tourists with their bicycles.
- g. 16 USC 530, Definitions, states:

“Multiple use” means. The management of all the various renewable surface resources of the national forests so that they are

utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for **periodic adjustments in use to conform to changing needs and conditions;**

Allowing primitive recreation areas to be managed under local control allows these periodic adjustments in use to be made on a timely basis when needed to conform to changing needs and conditions, including increasing the albedo effect to save our endangered flora, fauna and aquatic resources.

PLAINTIFF'S REQUESTS FOR RELIEF - Plaintiff respectfully requests this Court:

1. Declare the Forest Service has violated and continues to violate the law as alleged above;
2. Remand this matter back to the Forest Service with instructions to comply with NEPA, NFMA, the Travel Management Rule, and Forest Planning Rules as alleged above;
3. Set aside and vacate relevant and appropriate portions of the Forest Service's decision approving the revised Forest Plan pending compliance with the law;
4. Issue any other relief, including preliminary or permanent injunctive relief that Plaintiff may subsequently request;
5. Award Plaintiff his costs of suit, reasonable expenses, and attorneys' fees; and
6. Grant Plaintiff such other and further relief as the Court deems just and

equitable.

7th day of November, 2019

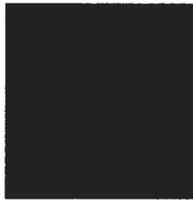
Respectfully submitted this ~~22nd~~ day of August, 2019.


Jerry O'Neil, Plaintiff

EXHIBIT

A

*Montana House Joint Resolution 9
urging the United States Congress to release certain
wilderness study areas in Montana from consideration for
inclusion in the National Wilderness Preservation System.*



A JOINT RESOLUTION OF THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE STATE OF MONTANA URGING THE UNITED STATES CONGRESS TO RELEASE CERTAIN WILDERNESS STUDY AREAS IN MONTANA FROM CONSIDERATION FOR INCLUSION IN THE NATIONAL WILDERNESS PRESERVATION SYSTEM.

WHEREAS, the 95th Congress passed the Montana Wilderness Study Act of 1977; and

WHEREAS, the Montana Wilderness Study Act required the Secretary of Agriculture to review certain lands within 5 years to determine suitability for preservation as wilderness and report the findings to the President; and

WHEREAS, almost 663,000 acres of land in Montana are designated under the Montana Wilderness Study Act, including the:

- (1) West Pioneer Wilderness Study Area comprising approximately 151,000 acres;
- (2) Blue Joint Wilderness Study Area comprising approximately 61,000 acres;
- (3) Sapphire Wilderness Study Area comprising approximately 94,000 acres;
- (4) Ten Lakes Wilderness Study Area comprising approximately 34,000 acres;
- (5) Middle Fork Judith Wilderness Study Area comprising approximately 81,000 acres;
- (6) Big Snowies Wilderness Study Area comprising approximately 91,000 acres; and
- (7) Hyalite-Porcupine-Buffalo Horn Wilderness Study Area comprising approximately 151,000 acres; and

WHEREAS, the 5-year period for review mandated by the Montana Wilderness Study Act expired in 1982; and

WHEREAS, the vast majority of Montana lands identified in the Montana Wilderness Study Act have never been formally recommended by the Secretary of Agriculture for inclusion in the National Wilderness Preservation System and no law has been signed by the President to designate these lands as wilderness; and

WHEREAS, these Montana lands are in legal limbo, a situation that causes extensive federal litigation as to what uses of the lands are appropriate and, in turn, places a burden on federal court resources; and

WHEREAS, uncertainty and wide swings in Executive Branch philosophy regarding the administration

of these lands are costing the public millions of dollars as forest assets burn and deteriorate and as investments in forest road construction and improvements are being deliberately destroyed; and

WHEREAS, administrative decisions and preservationist lawsuits have progressively reduced access to public lands for forest managers and the public; and

WHEREAS, the long-term sustainability of public lands depends on good stewardship and professional scientific site-specific management of forest resources; and

WHEREAS, Montana's historic heritage, customs, and culture are linked to the proper stewardship and use of the state's natural resources; and

WHEREAS, these lands are defacto wilderness in lieu of congressional action, a situation that has resulted in a waste of forest assets, no management of public forests, and a harmful reduction in forest road construction and multiple-use access improvements; and

WHEREAS, the failure by Congress to release the lands locked up by the Montana Wilderness Study Act of 1977 severely harms agriculture, timber harvesting, and multiple-use interests, as well as Montana communities and Montana families economically supported by those activities; and

WHEREAS, it is the consensus of the Montana Legislature that more than sufficient time has passed for the study of these lands as to their suitability for preservation as wilderness to be completed under the Montana Wilderness Study Act; and

WHEREAS, national forest lands released from wilderness study would still be subject to the National Forest Management Act, which requires extensive public involvement as the agency develops and updates plans for the management and use of resources in each forest; and

WHEREAS, the Montana Legislature on behalf of the citizens of the state assert that the time is ripe for final disposition of these lands.

NOW, THEREFORE, BE IT RESOLVED BY THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE STATE OF MONTANA:

That the Legislature supports scientific adaptive management to implement the multiple-use concept of public land use as mandated by the Multiple-Use Sustained Yield Act of 1960, to ensure the protection and improvement of forest health, and to maintain and improve the sustainability of federal forests located in Montana.

BE IT FURTHER RESOLVED, that the United States Congress enact legislation to release all wilderness study areas identified and specified in the Montana Wilderness Study Act of 1977 in order to secure the rights of Montana citizens to use these public lands for public purposes, including for purposes of multiple recreation

use, unless Congress confirms a study area for inclusion in the National Wilderness Preservation System.

BE IT FURTHER RESOLVED, that Congress:

(1) release all wilderness study areas and implement the concept of multiple use in order to fulfill the federal mandate as required by the Forest Management Act of 1897 to manage the national forests to "improve and protect the forest within the reservation, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States"; or

(2) consider redesignating the wilderness study areas as national recreation areas or national conservation areas.

BE IT FURTHER RESOLVED, that in its deliberations, Congress consider the land management alternatives in view of the Forest Management Act of 1897 in conjunction with the 2007 water compact between the state of Montana and the U.S. Department of Agriculture Forest Service since land management directly impacts the volume, quantity, and timing of water flows from watersheds in these wilderness study areas and impacts downstream water rights holders.

BE IT FURTHER RESOLVED, that the Legislature urges the Secretary of the Department of Agriculture to direct the Forest Service to immediately evaluate the impacts of the land management alternatives on the watersheds in the wilderness study areas and downstream water rights holders to help inform Congress in its deliberations.

BE IT FURTHER RESOLVED, that copies of this resolution be sent to the Governor of Montana, the Montana Congressional Delegation, the United States Secretary of the Interior, the United States Secretary of Agriculture, and the Chief of the United States Forest Service.

- END -

I hereby certify that the within joint resolution,
HJ 0009, originated in the House.

Speaker of the House

Signed this _____ day
of _____, 2017.

Chief Clerk of the House

President of the Senate

Signed this _____ day
of _____, 2017.

HOUSE JOINT RESOLUTION NO. 9
INTRODUCED BY K. WHITE, C. VINCENT

A JOINT RESOLUTION OF THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE STATE OF MONTANA URGING THE UNITED STATES CONGRESS TO RELEASE CERTAIN WILDERNESS STUDY AREAS IN MONTANA FROM CONSIDERATION FOR INCLUSION IN THE NATIONAL WILDERNESS PRESERVATION SYSTEM.

EXHIBIT B

Jerry O'Neil's UTC-11 submitted on 2/12/2018

Date submitted (UTC-11): 2/12/2018 12:00:00 AM

First name: Jerry

Last name: O'Neil

Organization:

Title:

Official Representative/Member Indicator:

Address1: 985 Walsh Road

Address2:

City: Columbia Falls

State: MT

Province/Region:

Zip/Postal Code: 59912

Country: United States

Email: oneil@centurytel.net

Phone: 406-250-2503

Comments:

I, Jerry O'Neil, submit this objection to the revised forest plan for the:

Flathead National Forest

Regional Forester's list of species of conservation concern Kootenai National Forest Plan Amendment

Lolo National Forest Plan Amendment

Helena-Lewis and Clark Forest Plan Amendments

Statement of issues and/or parts of the plan revision to which the objection applies: This objection applies to:

The creation of any new wilderness areas which do not allow the public to use pedal bicycles on the trails;

The failure of the plan to provide for intense enough timber harvesting, thinning and grazing to increase the albedo effect, thus contributing to global cooling in order to save the endangered species.

Concise statement explaining the objection and suggestion how the proposed plan should be improved:

ALBEDO EFFECT:

According to the article, "Effects of boreal forest vegetation on global climate," by Gordon B. Bonan, David Pollard & Stanley L. Thompson; published in "Letters to Nature" in Nature, Vol 359, on 22October 1992:

"Here we present results from a global climate model which show that the boreal forest warms both winter and summer air temperatures, relative to simulations in which the forest is replaced with bare ground or tundra vegetation. Our results suggest that future redistributions of boreal forest and tundra vegetation (due, for example, to extensive logging, or the influence of global warming) could initiate important climate feedbacks, which could also extend to lower latitudes."

It is apparent from reading this article that changing the albedo by thinning the forest by logging, grazing or burning will increase the reflectivity of the land, thus contributing to global cooling. Logging and grazing are preferable to burning because they do not release the carbon dioxide into the atmosphere anywhere near as fast as burning does.

They also do not contribute to the erosion and silting of our streams and lakes like burning does.

It has been stated that bull trout, grizzly bears, lynx and many other species are endangered by the effects of global warming. Therefore it is extremely important that we do what is possible to reduce global warming and that might contribute to global cooling.

It doesn't appear that the FNF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena, Lewis & Clark, and Kootenai NFs #46286 take into consideration the contribution of the albedo effect to counter global warming and thus preserve all the endangered species that are threatened by global warming.

The reason for this objection is:

The lack of any specific steps outlined in the plan(s) to increase the albedo effect by opening up the forest to counter global warming.

Proposed Solution:

Increasing the grazing of livestock and the harvest of timber, post, poles, and other forest products from these national forests in order to increase the albedo effect.

Statement demonstrating the link between objection and prior formal comments:

I previously formally made this objection in the public meetings put on by the U.S. Forest Service at the Supervisor's office north of Kalispell, Montana.

BICYCLES IN NEWLY CREATED WILDERNESS AREAS

I object to the minimal amount of allowance for the use of bicycles in the submitted forest plans. I therefore petition to:

Change the designation of any lands to be added to wilderness areas or recommended wilderness areas to "Primitive Recreation Areas";

Allow these areas to be managed at the local area by our local U.S.F.S. Supervisor rather than by the United States Congress;

Allow the use of pedal bicycles on the trails in these areas; and

Allow the use of chainsaws and other mechanized equipment for the development and maintenance of these trails for hiking, biking, horseback riding, cross country skiing and other recreational activities.

* "Non-motorized uses have not been shown to affect grizzly bear population recovery thus far. A lack of demonstrable effects and the difficulty of accurately measuring human use on non-motorized trails led to the decision by the conservation strategy team to no longer count on-motorized uses as deducting from secure core percentages (USFWS2013)." (page 414, Flathead National Forest, Volume 1: Revised Forest Plan)

* Far more people who visit Montana forests from their out of state homes bring bicycles with them than the number who bring horses.

* According to 36 CFR Part 219, Section 219.8(a)(4)(b) "Social and economic sustainability. The plan must include plan components, including standards or guidelines, to guide the plan area's contribution to social and economic sustainability, taking into account:

(2) Sustainable recreation; including recreation settings, opportunities, and access and scenic character;

(6) Opportunities to connect people with nature."

It is amazing to watch how many tourists visiting Montana have bicycles attached to their cars, pickups and RV's.

We presently have over a million acres of wilderness area in Montana. To put all the wilderness study areas into the existing wilderness (while it will provide many more acres for our local horseback riders), will deny its usage to the many tourists with their bicycles and to our local bicycle riders.

The reasons for this objection is:

Allow these areas to be managed at the local area by our local U.S.F.S. Supervisor rather than by the United States Congress;

1. Allow the use of pedal bicycles on the trails in these areas; and
2. Allow the use of chainsaws and other mechanized equipment for the development and maintenance of these trails for hiking, biking, horseback riding, cross country skiing and other recreational activities.

Proposed Solution: Do not create any more wilderness areas. Instead, create "primitive recreation areas that all for local supervision, the use of pedal bicycles on the trails and the use of chainsaws and other mechanized equipment for the development and maintenance of these trails.

Statement demonstrating the link between objection and prior formal comments:

I have previously formally made this objection in the public meetings put on by the U.S. Forest Service at the Supervisor's office north of Kalispell, Montana. In addition, I have provided Chip Weber, Supervisor of the Flathead National Forest a petition to provide "primitive recreational areas" rather than new recommended wilderness areas, signed by approximately 400 petitioners. I will be happy to provide a copy of these petitions again upon request.

EXHIBIT

C

*FNP Plan Revision & NCDE GBCS Amendment to the Lolo
Helena, Lewis & Clark, and Kootenai NFs #46286
10/02/2016 and 02/12/2018*

[Back to Public Reading Room](#)

FNF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena, Lewis & Clark, and Kootenai NFs #46286

Author Name: Jerry O'Neil

Organization Name:

Date Submitted: 02/12/2018

Document	Size (bytes)
18-0103 JerryONeil.pdf	85059
18-0103 Literature.pdf	353745
LetterText.pdf	6941

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FNF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena, Lewis & Clark, and Kootenai NFs #46286

Author Name: Jerry O'Neil
Organization Name:
Date Submitted: 02/12/2018

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FNF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena, Lewis & Clark, and Kootenai NFs #46286

Author Name: Jerry O'Neil

Organization Name:

Date Submitted: 02/12/2018

Document	Size (bytes)
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EXHIBIT D

*Jerry O'Neil's Objection to the Revised Forest Plan for the:
Flathead National Forest
Regional Forester's list of species of conservation concern
Kootenai National Forest Plan Amendment
Lolo National Forest Plan Amendment
Helena-Lewis and Clark Forest Plan Amendments*

Jerry O'Neil

985 Walsh Road
Columbia Falls, MT 59912
406-250-2503
oneil@centurytel.net

I, Jerry O'Neil, submit this objection to the revised forest plan for the:

- Flathead National Forest
- Regional Forester's list of species of conservation concern
- Kootenai National Forest Plan Amendment
- Lolo National Forest Plan Amendment
- Helena-Lewis and Clark Forest Plan Amendments

Statement of issues and/or parts of the plan revision to which the objection applies:

This objection applies to:

The creation of any new wilderness areas which do not allow the public to use pedal bicycles on the trails;

The failure of the plan to provide for intense enough timber harvesting, thinning and grazing to increase the albedo effect, thus contributing to global cooling in order to save the endangered species.

Concise statement explaining the objection and suggestion how the proposed plan should be improved:

ALBEDO EFFECT:

According to the article, "Effects of boreal forest vegetation on global climate," by Gordon B. Bonan, David Pollard & Stanley L. Thompson; published in "Letters to Nature" in Nature, Vol 359, on 22October 1992:

"Here we present results from a global climate model which show that the boreal forest warms both winter and summer air temperatures, relative to simulations in which the forest is replaced with bare ground or tundra vegetation. Our results suggest that future redistributions of boreal forest and tundra vegetation (due, for example, to extensive logging, or the influence of global warming) could initiate important climate feedbacks, which could also extend to lower latitudes."

It is apparent from reading this article that changing the albedo by thinning the forest by logging, grazing or burning will increase the reflectivity of the land, thus contributing to global cooling. Logging and grazing are preferable to burning because they do not release the carbon dioxide into the atmosphere anywhere near as fast as burning does.

They also do not contribute to the erosion and silting of our streams and lakes like burning does.

It has been stated that bull trout, grizzly bears, lynx and many other species are endangered by the effects of global warming. Therefore it is extremely important that we do what is possible to reduce global warming and that might contribute to global cooling.

It doesn't appear that the FNF Plan Revision & NCDE GBCS Amendment to the Lolo, Helena, Lewis & Clark, and Kootenai NFs #46286 take into consideration the contribution of the albedo effect to counter global warming and thus preserve all the endangered species that are threatened by global warming.

The reason for this objection is:

The lack of any specific steps outlined in the plan(s) to increase the albedo effect by opening up the forest to counter global warming.

Proposed Solution:

Increasing the grazing of livestock and the harvest of timber, post, poles, and other forest products from these national forests in order to increase the albedo effect.

Statement demonstrating the link between objection and prior formal comments:

I previously formally made this objection in the public meetings put on by the U.S. Forest Service at the Supervisor's office north of Kalispell, Montana.

BICYCLES IN NEWLY CREATED WILDERNESS AREAS

I object to the minimal amount of allowance for the use of bicycles in the submitted forest plans. I therefore petition to:

Change the designation of any lands to be added to wilderness areas or recommended wilderness areas to "Primitive Recreation Areas";

Allow these areas to be managed at the local area by our local U.S.F.S. Supervisor rather than by the United States Congress;

Allow the use of pedal bicycles on the trails in these areas; and

Allow the use of chainsaws and other mechanized equipment for the development and maintenance of these trails for hiking, biking, horseback riding, cross country skiing and other recreational activities.

* "Non-motorized uses have not been shown to affect grizzly bear population recovery thus far. A lack of demonstrable effects and the difficulty of accurately measuring human use on non-motorized trails led to the decision by the conservation strategy team to no longer count on-motorized uses as deducting from secure core percentages (USFWS2013)." (page 414, Flathead National Forest, Volume 1: Revised Forest Plan)

* Far more people who visit Montana forests from their out of state homes bring bicycles with them than the number who bring horses.

* According to 36 CFR Part 219, Section 219.8(a)(4)(b) "Social and economic sustainability. The plan must include plan components, including standards or guidelines, to guide the plan area's contribution to social and economic sustainability, taking into account:

- - -

(2) Sustainable recreation; including recreation settings, opportunities, and access and scenic character;

- - -

(6) Opportunities to connect people with nature.”

It is amazing to watch how many tourists visiting Montana have bicycles attached to their cars, pickups and RV's.

We presently have over a million acres of wilderness area in Montana. To put all the wilderness study areas into the existing wilderness (while it will provide many more acres for our local horseback riders), will deny its usage to the many tourists with their bicycles and to our local bicycle riders.

The reasons for this objection is:

1) Allow these areas to be managed at the local area by our local U.S.F.S. Supervisor rather than by the United States Congress;

2) Allow the use of pedal bicycles on the trails in these areas; and

3) Allow the use of chainsaws and other mechanized equipment for the development and maintenance of these trails for hiking, biking, horseback riding, cross country skiing and other recreational activities.

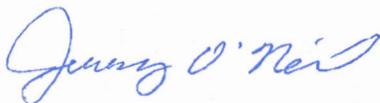
Proposed Solution:

Do not create any more wilderness areas. Instead, create “primitive recreation areas that all for local supervision, the use of pedal bicycles on the trails and the use of chainsaws and other mechanized equipment for the development and maintenance of these trails.

Statement demonstrating the link between objection and prior formal comments:

I have previously formally made this objection in the public meetings put on by the U.S. Forest Service at the Supervisor's office north of Kalispell, Montana. In addition, I have provided Chip Weber, Supervisor of the Flathead National Forest a petition to provide "primitive recreational areas" rather than new recommended wilderness areas, signed by approximately 400petitioners. I will be happy to provide a copy of these petitions again upon request.

Signature: /s/ Jerry O'Neil



EXHIBIT

E

Letters to Nature
Effects of boreal forest Vegetation
on global climate

16. Houghton, J. T., Jenkins, G. J. & Ephraums, J. J. (eds) *Climate Change: The IPCC Scientific Assessment* (Cambridge Univ. Press, Cambridge, 1990).
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Effects of boreal forest vegetation on global climate

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TERRESTRIAL ecosystems are thought to play an important role in determining regional and global climate^{1–6}; one example of this is in Amazonia, where destruction of the tropical rainforest leads to warmer and drier conditions^{4–6}. Boreal forest ecosystems may also affect climate. As temperatures rise, the amount of continental and oceanic snow and ice is reduced, so the land and ocean surfaces absorb greater amounts of solar radiation, reinforcing the warming in a 'snow/ice/albedo' feedback which results in large climate sensitivity to radiative forcings^{7–9}. This sensitivity is moderated, however, by the presence of trees in northern latitudes, which mask the high reflectance of snow^{10,11}, leading to warmer winter temperatures than if trees were not present^{12–14}. Here we present results from a global climate model which show that the boreal forest warms both winter and summer air temperatures, relative to simulations in which the forest is replaced with bare ground or tundra vegetation. Our results suggest that future redistributions of boreal forest and tundra vegetation (due, for example, to extensive logging, or the influence of global warming) could initiate important climate feedbacks, which could also extend to lower latitudes.

The global climate model¹⁵ combines atmospheric general circulation with transfer of energy, moisture and momentum between the atmosphere and oceans and land surfaces. The atmospheric general circulation model is derived from the National Center for Atmospheric Research community climate model CCM1¹⁶, but with new treatments of clouds¹⁷, penetrative plume convection, planetary boundary-layer mixing, solar radiation and its diurnal cycle¹⁸, and semi-Lagrangian transport of water vapour^{19–21}. The surface models include vegetation transfer schemes similar to the biosphere–atmosphere transfer scheme BATS²² and the simple biosphere model SiB²³, multilayer models of heat and moisture flow in soil, snow and sea ice, and a slab ocean mixed layer²⁴. Important features of the vegetation model are: vegetation is represented by upper and lower canopy layers; the absorption, transmission and reflection of solar radiation in each layer are calculated from the two-stream approximation, with separate calculations for direct and diffuse radiation in visible and near-infrared wavelengths; wind is modelled using mixing-length logarithmic profiles above and between layers and a simple diffusive model within each layer; water and snow are intercepted by and cascade through the canopy; and irradiance, temperature, vapour pressure and soil moisture control stomatal resistance. The soil model simulates soil moisture, temperature and permafrost. The snow model simulates varying snow depth and fractional areal cover on the ground. The atmospheric general circulation model has a horizontal resolution of $\sim 4.5^\circ$ latitude by 7.5° longitude, whereas all surface models use a horizontal grid of 2° by 2° . Soil properties are

assigned on the basis of their texture and colour as in BATS²², and vegetation attributes are prescribed as in SiB²⁵.

The boreal forest is a broad circumpolar mixture of evergreen needleleaf, deciduous needleleaf and deciduous broadleaf tree species, occupying $11.6 \times 10^6 \text{ km}^2$ in Arctic and sub-Arctic regions²⁶. We did simulations with the boreal forest present (as a control) and with all forests north of 45° N replaced by bare ground, which is equivalent to moving the treeline between boreal forest and tundra vegetation southwards. We used the same soil properties in both sets of simulations. Although this perturbation is extreme, it is an appropriate way of isolating the climatic significance of the boreal forest. Moreover, extensive logging operations may be common in the future, especially in Siberia²⁷.

With interactive oceans, the removal of the forest vegetation increased the land surface albedo during January and April (Fig. 1a, b), causing colder air temperatures than in the control simulation (Fig. 2a, b). The largest change in air temperature occurred in April, when land surfaces were as much as 12° C colder (Fig. 2b). The air continued to be as much as 5° C colder in July (Fig. 2c), despite little change in albedo (Fig. 1c). October was 5° C colder at 60° N (Fig. 2d), and albedo increased as snow cover increased (Fig. 1d).

The changes in temperature of the upper snow and soil layers followed the same pattern as air temperature. The moisture content of the upper soil layer (0 to 5 cm depth) was little changed from the control simulation for January and July. The soil was drier between 45 and 55° N in April, when snow began to melt in the control simulation but not in the deforested simulation. October was also drier from 55 to 65° N , where colder air temperatures in the deforested simulation caused precipitation to fall as snow rather than as rain as in the control simulation. Similar patterns of moisture change occurred in the next two soil layers (5–15 cm depth and 15–35 cm depth).

The perturbation caused by replacing existing forest with bare ground is the largest possible change we could make. We examined the sensitivity of our results to smaller perturbations through additional experiments in which (1) the boreal forest was replaced with tundra vegetation and (2) the soil in the bare-ground simulation was made as dark as possible. Neither of these significantly altered the changes in air temperatures caused by deforestation. In particular, the short stature, low leaf

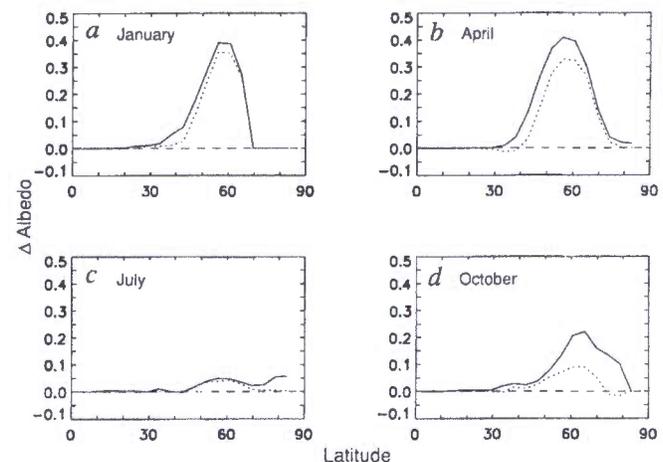


FIG. 1 Zonally averaged surface albedo over land. Albedos are expressed as the difference between the deforested and control simulations. a, January; b, April; c, July; d, October. (—), Simulations with interactive SST and sea ice. Control and deforested simulations were each integrated for 15 years, and albedos were averaged over the last five years. (⋯), Simulations with prescribed SST and sea ice. Control and deforested simulations were each integrated for five years, and albedos were averaged over the last four years.

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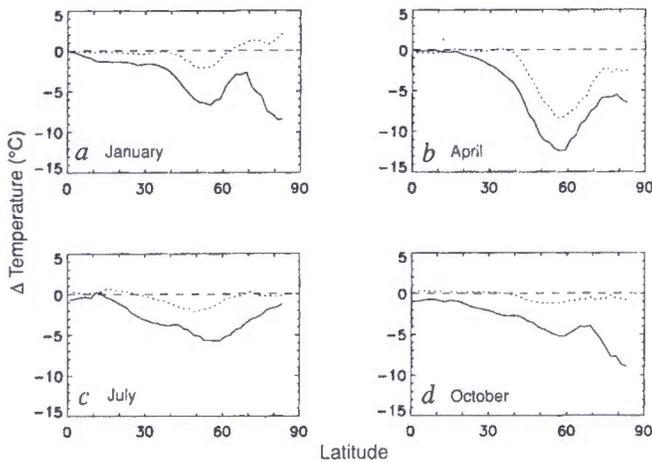


FIG. 2 Zonally averaged air temperature at a height of 2 m above land surfaces. See Fig. 1 for details.

area index and low fractional cover of tundra vegetation prevent it masking the snow albedo.

The summer climate cooling was caused in part by oceanic influences. The colder winter air temperatures caused by deforestation reduced the sea surface temperatures (SST) in Arctic regions. The oceans introduced a thermal lag which inhibited warming in the summer. In addition, the extent of sea ice increased because of the colder winter climate, reinforcing the cooling because of higher ocean albedos.

To examine the importance of the oceans, we did an additional experiment in which SST and sea ice were prescribed from ref. 28 as in the standard CCM1¹⁶. With prescribed SST and sea ice, the climate cooling caused by the deforestation was much less than that simulated with interactive oceans (Fig. 2). In particular, roughly one-third to one-half of the July cooling was due to interactive oceans (Fig. 2c). This implies that the winter-spring cooling pulse caused by boreal deforestation is perpetuated year-round by the thermal reservoir of the oceans and is amplified by the positive feedback due to sea ice.

The effects of the boreal forest on climate extended well beyond the region where the forest was removed. Air temperatures at 30° N were 1.6 to 3.2 °C cooler throughout the year (Fig. 2). Even at 10° N, air temperatures were 1 °C cooler in January and October (Fig. 2). These hemispheric climate changes are much larger than those due to deforestation in the Amazon⁴⁻⁶.

Sensitivity analyses with the land surface model alone (without reciprocal coupling to the climate model) indicated that deforestation should instead create a warmer land surface climate on calm summer days. The different predictions given by the land surface model used alone, used with the fully coupled climate model, and used with prescribed SST and sea ice show that the effect of deforestation on summer air temperatures cannot be resolved by studying only one component process of the system. The climate of northern latitudes is a highly interactive system in which coupling among the atmosphere, oceans and land surfaces cannot be ignored.

Research on biosphere-atmosphere interactions in Arctic and sub-Arctic regions has mainly focused on biogeochemical feedbacks: boreal forest ecosystems contain large quantities of organic carbon^{26,29}, affect the seasonal dynamics of atmospheric CO₂ (refs 30, 31) and can be large annual carbon sinks³². The sensitivity of high-latitude climate to increasing atmospheric concentrations of CO₂ (ref. 33) has focused attention on carbon feedbacks to the atmosphere that may accentuate climate change^{29,33,34}. Our studies suggest that the physical effects of boreal forests on climate are as significant as the expected biogeochemical effects.

Historically, it has been thought that the extent and nature of the boreal forest were determined by climate³⁵⁻³⁹. Contours of climate indices do in fact outline the geographical boundaries of the boreal forest and its subdivisions³⁵⁻³⁷. But our results and previous studies¹²⁻¹⁴ indicate that the locations of the boreal forest and of correlated climate indices are the outcome of coupled dynamical interactions in which the geographical distribution of the boreal forest affects climate and vice versa. For example, the current northern and southern boundaries of the boreal forest are correlated with the positions of the July 13 °C and July 18 °C isotherms, respectively³⁶. Assuming that the July isotherms are causal, the summer cooling caused by deforestation is sufficient to prevent forest regrowth in much of the

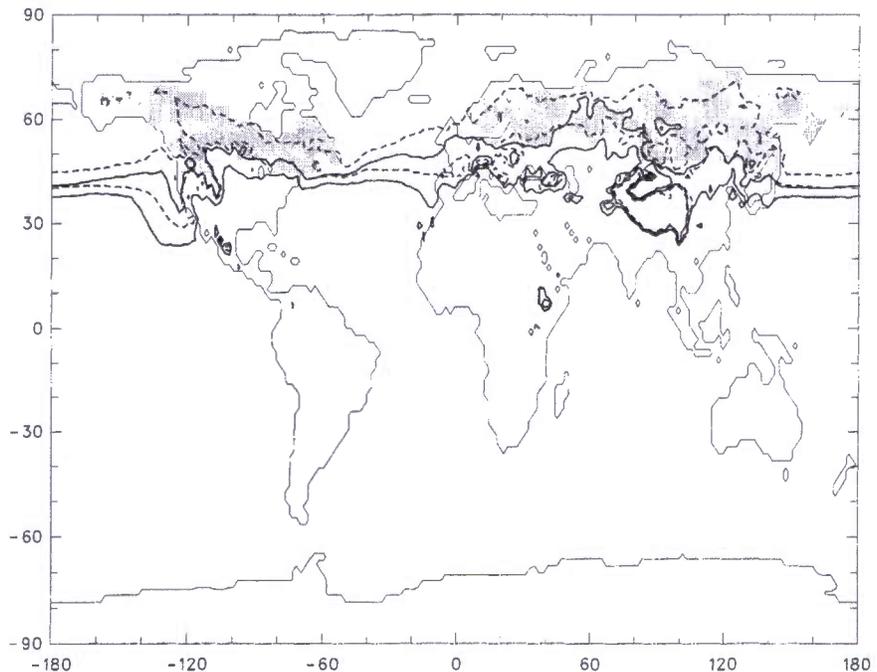


FIG. 3 Relationship between area of forest removed and the 13 °C and 18 °C temperature isotherms for July. Shaded region shows the area of forest vegetation removed for the deforested simulation. (....), Positions of the July 13 °C and July 18 °C isotherms based on observed temperature records. (—), Positions of these isotherms after the forest was removed.

deforested area (Fig. 3). Thus, boreal deforestation may initiate a long-term irreversible feedback in which the forest does not recover and the treeline moves progressively farther south.

The position of the treeline distinguishing boreal forest from tundra vegetation has altered in response to past climate changes^{40–42} and is likely to change with the warmer climate

caused by increased atmospheric CO₂ concentrations^{43–46}. Our studies raise the possibility of considerable climate changes caused merely by redistribution of boreal forest and tundra ecosystems. The decrease in snow-covered land surface albedo caused by northward migration of boreal forest into tundra in response to climate warming may produce further warming. □

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Evidence from Re–Os isotopes for plume–lithosphere mixing in Karoo flood basalt genesis

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THERE is abundant evidence to link continental flood basalt provinces with mantle plume activity^{1,2}; however, flood basalts often have radiogenic isotope signatures that are outside the range for plume sources as recorded in ocean-island basalts. These signatures are more readily attributed to source regions within the continental lithosphere, and there are strong indications that it is often the mantle lithosphere that contributes isotopically 'enriched' (low-¹⁴³Nd/¹⁴⁴Nd) material^{3,4}. There are objections, however, to models that propose cold, refractory mantle lithosphere as an important source of basaltic magma⁵. The rhenium–osmium system may provide new constraints on the relative importance of plume and sub-continental lithospheric mantle (SCLM) in basalt genesis: samples of SCLM brought to the surface as xenoliths commonly have low ¹⁸⁷Os/¹⁸⁸Os ratios^{6,7}, whereas ocean-island basalts tend to have higher than chondritic ¹⁸⁷Os/¹⁸⁸Os, and old continental crust has even higher (more radiogenic) ratios. Here we report initial ¹⁸⁷Os/¹⁸⁸Os ratios for 190-Myr-old picrite basalts from the Nuanetsi region of the Karoo flood basalt province, which are most readily explained as mixtures between enriched SCLM and sub-lithospheric material, most probably derived from a mantle plume.

Picrite basalts from the Karoo flood basalt province have been the subject of extensive geochemical study^{8–10}, in part because

they are considered to represent primitive magmas similar to parental liquids that evolve to form the abundant, tholeiitic basalts typical of this and other flood basalt provinces^{8,11}.

The radiogenic isotope and incompatible trace element compositions of these rocks have been attributed¹² to mixing between asthenospheric melts that are poor in incompatible trace elements and material derived from the SCLM that is rich in incompatible trace elements. Even small amounts of the lithospheric component are rich enough in most incompatible trace elements to dominate the composition of the hybrid magmas. The incompatible elements, and in particular Nd and Pb isotope ratios, are of limited efficacy as indicators of sub-lithospheric source regions, because they are easily overwhelmed by the SCLM endmember.

By contrast, the Re–Os system does not seem to be strongly influenced by the processes that cause the SCLM to be enriched in incompatible trace elements. From the numerous Re–Os isotope analyses now available for peridotite mantle xenoliths^{6,7} it seems that the SCLM consistently preserves a history of low Re/Os ratio recorded by low ¹⁸⁷Os/¹⁸⁸Os values. Furthermore, even samples that have undergone ancient enrichment in incompatible trace elements retain the low Re/Os signature, so that enriched portions of the SCLM become characterized by both low γ_{Os} and low ϵ_{Nd} .

$$\gamma_{Os} = [((^{187}Os/^{188}Os)_{\text{sample}} / (^{187}Os/^{188}Os)_{\text{mantle}}) - 1] \times 100$$

$$\epsilon_{Nd} = [(((^{143}Nd/^{144}Nd)_{\text{sample}} / (^{143}Nd/^{144}Nd)_{\text{mantle}}) - 1) \times 10^4$$

where 'mantle' implies the chondritic estimate for the bulk mantle.

Thus, even portions of the SCLM rich in incompatible trace elements are unlikely to vary greatly in Os concentration or isotopic composition, so ¹⁸⁷Os/¹⁸⁸Os is potentially a much more useful tracer of sub-lithospheric source materials than the isotopic compositions of incompatible elements such as Sr, Nd and Pb. Furthermore, the association of low γ_{Os} with low ϵ_{Nd}